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Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System

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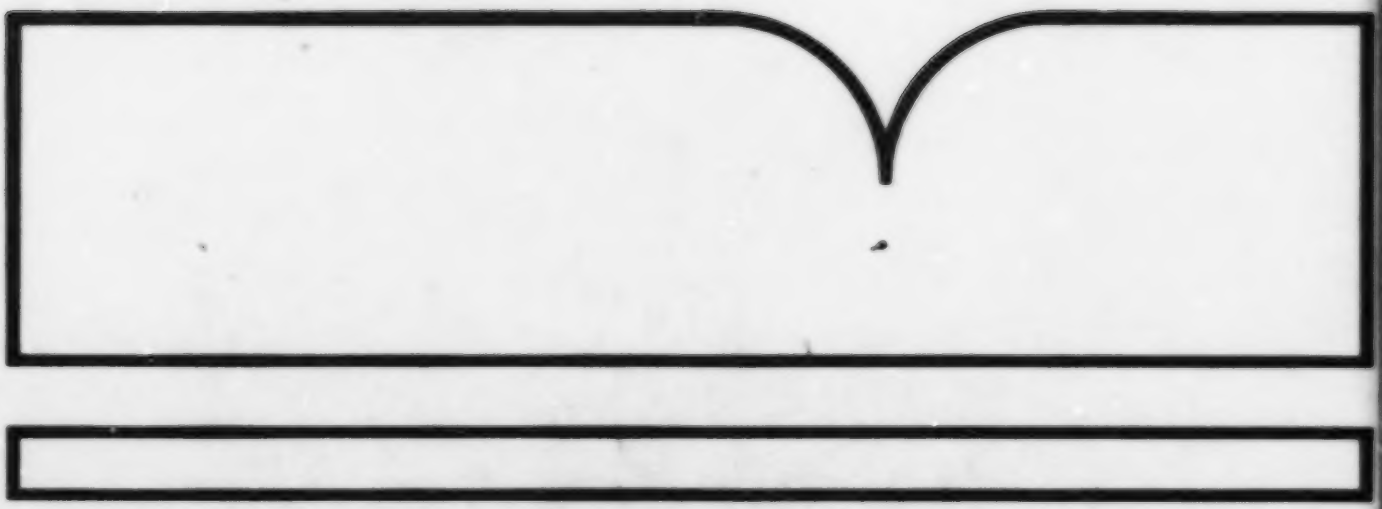

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National Air Pollution Control Administration
Department of Health, Education, and Welfare

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The exhaust emission characteristics of a vehicle equipped with a DuPont exhaust emission control system were measured to provide a comparison with other low emission vehicles having the potential for meeting proposed 1975 Federal Standards.

To obtain emission data, DuPont delivered for test a 1970 Chevrolet equipped with their latest reactor system. This was a typical vehicle with the following modifications: exhaust manifold reactor, exhaust gas recirculation, manifold air injection, particulate traps with special exhaust systems, and carburetor modifications. The vehicle used a 350 cubic inch engine with automatic transmission. All tests were run using Indolene 30 fuel.

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Vehicles Tested

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Tests Used

The following tests were conducted:

1. Standard 1970 Federal test procedure for exhaust emissions.

2. A closed, constant volume sampling technique using 9 repeats of the Federal emissions test cycle (CVS).

3. A closed, constant volume sampling technique using the new LA4-S3 driving schedule.

Emission values were obtained both on a concentration basis and on a mass basis.

Closed cycle data were taken using a constant volume sampling technique. Bag samples were analyzed using non-dispersive infrared analyzers for carbon monoxide and carbon dioxide with hydrocarbons measured using a flame ionization detector. The modified Saltzman wet chemical method was used to determine oxides of nitrogen.

Emission Results

The data shown in Table 1 compare one test run on the DuPont automobile with the average of six similar 1970 passenger cars tested and with the best of the six. This testing method utilizes a continuous sample of the exhaust products throughout the entire test. The DuPont vehicle shows excellent

control over hydrocarbons and oxides of nitrogen but only minimal control over carbon monoxide.

In Table 2, the results of all tests are reported. The tests run on April 23, 1970, showed an increase in both hydrocarbon and carbon monoxide emissions and a control system failure of some type was suspected. On examination of the engine a burned spark plug lead wire was found and replaced. The hot cycle data on April 24, 1970, indicated that the problem had been corrected. As the wire was replaced prior to the LA4-S3 test, these data are assumed to be representative.

No attempt was made to evaluate driveability or fuel economy. The vehicle was turned over to DuPont at the conclusion of testing on April 24, 1970. Some problems were found by DuPont in the bypass system that allowed some exhaust to circumvent the reactor; the effect of this problem on emissions is not known but it is suspected to be minimal. Additional testing of this vehicle in the future is planned, and some type of driving evaluation is proposed.

Conclusions

1. The DuPont exhaust emission control system greatly reduces unburned hydrocarbons.

2. The DuPont system reduces oxides of nitrogen.

3. Very little effect is shown on carbon monoxide compared with standard production vehicles.

4. Additional testing and evaluation of driveability and economy would be beneficial.

Table 1

Cold 9 cycle CVS Data

	DuPont Reactor 1970 Chevy 350	Average of 6 1970 Chevy 350	Best of 6
HC	0.70	3.07	2.23
CO	24.34	37.35	22.35
NO_x*	1.29	3.24	2.29

*NO_x data from Whittaker "NOX Box", an electrochemical oxides of nitrogen analyzer.

Table 2

Results of Tests*

April 22, 1970 — Federal Test and 9 CVS

Cold 1970 Federal Procedure
HC = 0.20 gm/mi
CO = 11.72 gm/mi

Cold 9 CVS
HC = 0.70 gm/mi
CO = 24.34 gm/mi
NO_x = 1.23 gm/mi
NO = 0.80 gm/mi

April 23, 1970 — Federal Test and 9 CVS

Cold 1970 Federal Procedure
HC = 0.5 gm/mi
CO = 13.46 gm/mi

Cold 9 CVS
HC = 1.40 gm/mi
CO = 26.58 gm/mi
NO_x = 1.45 gm/mi
NO = 0.94 gm/mi

April 24, 1970 — LA4-S3 and Hot Cycles

Cold LA4-S3
HC = 0.17 gm/mi
CO = 27.17 gm/mi
NO_x = 1.06 gm/mi
NO = 0.69 gm/mi

Hot 1970 Federal Procedure
HC = 16 ppm
CO = 0.2 %

*Federal Test is the 1970 Federal Emissions test procedure from a cold start.

9-CVS is a closed cycle using 9 repeats of the Federal emission test cycle with constant volume sampling and cold start.